

App. No. 10/584,725
Office Action Dated April 14, 2008

REMARKS

Favorable reconsideration is respectfully requested in view of the above amendments and following remarks. Applicants appreciate the courtesy shown by the Examiner in discussing this case with Applicants' representative on July 8, 2008. The discussions of the interview are reflected in the following remarks.

Claims 1, 2, 3, 9 and 12-17 have been amended. The limitation in claim 1 concerning the flux components is supported by for example page 13, lines 5-6 of the specification. The limitation in claim 1 concerning the melt is supported for example by page 13, lines 5-21 of the specification. The limitation in claim 1 concerning the proportion of Mg is supported by for example page 13, line 26 to page 14, line 2 and Figure 7 of the specification. The amendments to claims 2 and 3 are supported by the specification, for example at page 6, lines 8-9 and 18-20 of the specification. The amendments to claim 9 are supported by the specification, for example at page 6, lines 13-15 and page 9, lines 15-20 of the specification. Claims 12-17 have been amended editorially. Claims 18 and 19 are new, and are supported by page 9, lines 15-20 and page 13, lines 9-10 of the specification. Claims 6-8 and 10-11 have been canceled without prejudice or disclaimer. No new matter has been added. Claims 1-5, 9 and 12-19 are pending.

Claim rejections - 35 U.S.C. § 112

Claim 11 is rejected under 35 USC 112, second paragraph, as being indefinite. The rejection is rendered moot as claim 11 has been canceled.

Withdrawal of the rejection is respectfully requested.

Claim rejections - 35 U.S.C. § 102

Claims 1-6, 8-9 and 15-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Jeong et al. (KR 10-2001-0000827). The limitations from previous claim 7 are now incorporated in claim 1. Claims 2-5 and 15-17 further limit and depend from claim 1. Applicants do not concede the correctness of the rejection.

Withdrawal of the rejection is respectfully requested.

Claim rejections - 35 U.S.C. § 103

Claims 7 and 10-14 are rejected under 35 USC 103(a) as being unpatentable over Jeong et al. as applied to claim 1-9 and 15-17 above, and further in view of Yoshida (US 6,534,801). Applicants respectfully traverse the rejection.

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Claim 1 is directed to a method for producing a GaN crystal. Claim 1 requires growing a crystal in a nitrogen-containing atmosphere by reacting Ga with nitrogen in a melt that includes Ga, nitrogen and flux components. The melt is formed by heating Ga, Mg, and purified Na in a nitrogen-containing atmosphere. The flux components are Na and Mg. Claim 1 requires that the proportion of Mg in a sum of Na and Mg is in a range of 0.1 to 5 mol%.

Advantageously, when GaN crystals are prepared as required by claim 1, the amount of nitrogen dissolved in the melt can be increased (see, for example, Example 1 on page 13, line 5 to page 14, line 2 of the specification and Figure 7) so as to allow a high growth rate of the crystals and improved reproducibility of the crystal growth (page 3, lines 23-26 of the specification).

Jeong is directed to a method for producing GaN crystals. The method involves mixing NaN_3 and gallium, where NaN_3 is used as the catalyst (see paragraph 37). The reference notes that in the process of forming the mixture, one among Mg, Na, Sr and Ba can be used as a dopant (see paragraph 26). However, nothing in the reference directs any particular attention to using more than one dopant, and in fact, none of the working examples even use any of the listed dopants. The reference likewise provides no reason to select Mg and Na as flux components, nor any reason to form a melt by heating Ga together with purified Na and Mg, nor expect that the amounts of Mg could be limited relative to Na as required by claim 1 so as to achieve the benefit of superior crystal growth of GaN crystals shown in the present specification. Accordingly, claim 1 and the dependent claims therefrom are patentable over Jeong.

The rejection relies on Yoshida for the amounts of Mg used as a flux component. However, Yoshida does not cure the deficiencies of Jeong.

More particularly, Yoshida is directed to providing a GaN-based HEMT having a semi-insulating substrate on which a buffer layer is formed, and a layered structure that is formed on the buffer layer, the layered structure having an undoped GaN layer (col. 4, lines 31-37). Yoshida teaches that the undoped GaN layer is formed by doping a p-type impurity such as C or Mg during the formation of the undoped GaN layer (col. 3, lines 36-38). While Yoshida teaches setting the dope amount of the p-type impurity in the range of 2×10^{17} to $5 \times 10^{16} \text{ cm}^{-3}$, the reference likewise does not provide any reason to use Mg together with another dopant, and in fact, the working example provided uses only Mg. The reference likewise provides no reason to

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combine Mg with Na, let alone provide any reason to expect with any reasonable degree of certainty that the amounts of Mg could be limited relative to Na as required by claim 1 so as to achieve the benefit of superior crystal growth of GaN crystals shown in the present specification. Accordingly, claim 1 and the dependent claims therefrom are patentable over the references, taken alone or together.

Favorable reconsideration and withdrawal of the rejection are respectfully requested.

In view of the above, favorable reconsideration in the form of a notice of allowance is requested. Any questions or concerns regarding this communication can be directed to the attorney-of-record, Douglas P. Mueller, Reg. No. 30,300, at (612) 455.3804.



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DPM/ym

Respectfully submitted,

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